

McELROY, DEUTSCH, MULVANEY & CARPENTER, LLP
ATTORNEYS AT LAW

1300 MOUNT KEMBLE AVENUE
P.O. BOX 2075
MORRISTOWN, NEW JERSEY 07962-2075
(973) 993-8100
FACSIMILE (973) 425-0161

JAMES D. RAY
Direct Dial: (973) 425-8707
jray@mdmc-law.com

VIA EMAIL AND OVERNIGHT MAIL

September 15, 2014

Joseph Canzano
Spill Prevention Compliance Coordinator
U.S. Environmental Protection Agency, Region 1
5 Post Office Square, Suite 100
Mail Code OES04-4
Boston, MA 02109-3912

Re: Request for Information, Docket No. 14-308-28, Discharge of
Anhydrous Ammonia from Preferred Freezer Services, LLC
("Facility"), 380 South Worcester, Norton, MA 02766 on or about
April 3, 2014 into the Wading River

Dear Mr. Canzano:

This firm represents Preferred Freezer Services of Norton, LLC ("PFS") in connection with the referenced incident at the Facility. We are in receipt of your Request for Information ("RFI") dated June 15, 2014. We have re-printed below each of the questions set forth in the RFI and provided responses to each. We are delivering these responses pursuant to an agreement reached with Jeff Kopf, Senior Enforcement Counsel, USEPA Region I, to extend the time for this response until September 16, 2014.

1. Please provide a detailed description of the above-referenced discharge, including:
 - a. Provide the date and time the discharge occurred, the date and time the discharge was discovered, and the date and time the discharge was reported to the National Response Center and any other appropriate federal, state and/or local agencies (e.g., EPA, state environmental agency, fire department). Include the name and phone number of the agency personnel contacted.

RESPONSE: On April 3, 2014 at approximately 7:45am, a PFS maintenance mechanic, David Tavares, was draining oil from the +20 °F high temperature recirculator oil pot (the "Subject Vessel") as part of routine maintenance activities. The spring loaded oil drain valve on the oil pot failed in the open position. Upon investigation after the

incident, it was found that there was a mechanical failure of the internal components of the spring loaded valve. [See attached Letter Report of American Refrigeration Company, Inc. ("American Refrigeration") dated April 11, 2014, **Exhibit 1** hereto]. It is noted that David Tavares and American Refrigeration had operated this spring loaded valve on many occasions prior to the incident in question without any issue.

Upon realizing that the valve would not reset, Mr. Tavares pressed the emergency stop, which shut down the entire refrigeration system. This action stopped any additional ammonia from returning to the Subject Vessel. This minimized the release to what was in the vessel and not the entire charge in the refrigeration system.

PFS made notification to the Norton Fire Department at approximately 7:45 AM by the automatic ammonia leak detection alarm. After determining that the release exceeded 100 pounds, a second notification was made by telephone to the National Response Center (800-424-8802) at approximately 8:10 AM. A third notification was made immediately thereafter by telephone to the State of Massachusetts Emergency Response Commission (508-820-2000).

- b. If the spilled material entered one or more bodies of water, or their adjoining shorelines, provide the name of each body of water.

RESPONSE:

As further discussed below, some of the ammonia that was released from the Subject Vessel apparently made its way onto the floor to a floor drain/trench located near the Subject Vessel and ultimately to a seasonal ditch behind the Facility. Local officials did not know the name of the ditch. As noted below, PFS does not assume or admit any liability with respect to the discharge of ammonia to the ditch/creek mentioned above.

- c. Provide the quantity of material spilled, and the quantity entering a water body or adjoining shoreline. If the spilled material was a mixture, give the chemical name of each component in the mixture and its percentages by weight in the mixture. If the material spilled was petroleum, give the grade of oil.

RESPONSE: PFS's refrigeration contractor, American Refrigeration, reported to the Facility on the date of the incident at approximately 8:15 AM. American Refrigeration estimated (based upon a volume calculation) that approximately 2,168 pounds of anhydrous ammonia was released from the refrigeration system during the incident. (See **Exhibit 1**). Some of that volume was released to the atmosphere and some, in liquid form, spilled onto the concrete floor under the Subject Vessel. Some of the ammonia that

spilled onto the floor apparently made its way to a floor drain/trench located in the pavement in front of the engine room door. This floor drain/trench is approximately 18 feet from the location of the Subject Vessel. Upon information and belief, this floor drain/trench was designed to discharge to a detention basin in the parking lot of the Facility. That detention basin was apparently not operating at the time of the ammonia spill, which caused the ammonia to be discharged to the seasonal ditch/creek mentioned above instead of collecting in the detention basin. PFS does not assume or admit any liability with respect to the discharge of ammonia to the ditch/creek mentioned above. It is the position of PFS that the floor/trench drain, which was installed by the owner of the Facility or the prior owners or prior operators, should not have been located in such close proximity to the Subject Vessel. Indeed, the floor/trench drain was located in such a position that it was nestled in between several items of equipment that contained ammonia, including the Subject Vessel, a -20°F low temperature recirculator oil pot (approximately 35 ft. from the floor/trench drain) and a high pressure receiver (approximately 9 ft. from the floor/trench drain). It is also the position of PFS that if the detention basin had been working, the volume of ammonia that made its way onto the floor and then into the floor drain/trench would have been captured in the detention basin and would not have made its way to the ditch/creek mentioned above. In documentation between PFS and the owner at the time PFS entered the Lease (November 22, 2013) with the owner, the owner had agreed to repair the abandoned/closed detention basin, but that repair work had not been performed prior to the incident in question. For the foregoing reasons, PFS does not admit any liability for any discharge that might have occurred in violation of Section 311(b)(3) of the Clean Water Act or any other statute or regulation.

- d. Describe the pathway the spilled material traveled, starting from the original spill point (e.g., the tank in which the material was stored) to the most distant water body into which it flowed.

RESPONSE: See response to item 1.c. above.

- e. Provide the age of the tank from which the material spilled and the date and results of the last tank integrity test that was performed on the tank (e.g., pressure, shell thickness).

RESPONSE: See Form U-1 Manufacturer's Data Report for Pressure Vessels, attached hereto as **Exhibit 2**, which provides information concerning the Subject Vessel.

- f. Describe the extent to which the discharge caused a film or sheen on the surface of the water or adjoining shoreline, and/or caused a sludge or emulsion to be deposited on the water body bottom or on adjoining shorelines.

RESPONSE: PFS did not observe any film or sheen on the surface of the water.

- g. Describe any environmental damage resulting from the spill, such as fish kills, dead waterfowl or animals, stained vegetation or soil, etc. Provide any documentation in your possession related to the environmental damage resulting from the spill.

RESPONSE: PFS did not observe any fish kills, dead waterfowl or animals, stained vegetation or soil. As we understand it, the owner of the Facility contracted Clean Harbors to conduct certain environmental response actions resulting from the incident.

- h. Describe any damage to public or private property, such as road surfaces, bridge abutments, dams, beaches, boat hulls, wells, etc.

RESPONSE: PFS is not aware of any such damage. However, as noted above, it is the position of PFS that it is not responsible for any damage that may have occurred after the ammonia entered the floor drain/trench.

- i. Provide a summary of events immediately preceding the spill event, including the probable cause of the spill.

RESPONSE: See response to item 1.a. above.

- j. Describe any actions taken to control and/or remove the spilled material from the environment or to mitigate its effects on the environment, including a summary of the costs of such actions. Please provide copies of all clean-up contractor invoices and manifests.

RESPONSE: The spill cleanup was handled by the owner of the Facility. As we understand it, the owner of the Facility contracted Clean Harbors to conduct certain environmental response actions resulting from the incident.

- k. Describe any measures taken after the spill event to prevent a recurrence, including the costs of such measures.

RESPONSE: The spring loaded valve in question was replaced by American Refrigeration and the other similar spring loaded valve on the system was also replaced. The ammonia refrigeration system was shut down and pumped out on June 19, 2014. PFS is not privy to what action was taken by the owner of the Facility to rectify the defective design of the floor drain/trench and the repair of the detention basin.

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1. Provide the names, titles, addresses and phone numbers of employees and officials you believe to have knowledge of the facts surrounding the spill event.

RESPONSE:

David Tavares, PFS Maintenance, 55 Murphy Drive, Avon, MA 02322, 774-254-6017

Bill Casey, PFS General Manager, 55 Murphy Drive, Avon, MA 02322, 508-962-1251

Bob Walsh, PFS Corporate Maintenance Manager, 1 Main Street, Chatham, NJ 07928, 973-820-4458

Mark Sens, PFS Director Health, Safety and Environmental, 1 Main Street, Chatham, NJ 07928, 973-820-4467

Kelly McAteer, PFS Manager Health, Safety and Environmental, 1 Main Street, Chatham, NJ 07928, 973-820-4469

380 SWR Norton LLC, c/o Calare Properties, Inc., 43 Broad Street, Hudson, MA 01749, the owner of the Facility.

Marcia Pereira, PM Realty Group, Property Manager for Owner, 43 Broad Street, Suite C404, Hudson, MA 01749, 978-763-4103

Ken Mcdermott, Clean Harbors Environmental Services, Senior Project Manager, 42 Longwater Drive, Norwell, MA 02061, 781-792-5823 ext. 5823

Paul Ivanoski, American Refrigeration, Refrigeration Technician, 149 River Street, Suite 6, Andover, MA 01810, 978-474-4000

Rob Morgo, American Refrigeration, Service Manager, 149 River Street, Suite 6, Andover, MA 01810, 978-474-4000

Norton Fire Department, 70 East Main Street, Norton, MA 02766, (508) 285 - 0248

MA Department of Environmental Protection

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USEPA

- m. Provide copies of any investigative reports by state environmental agencies, state or local police, fire departments, insurance companies, etc.

RESPONSE: See **Exhibit 1** attached.

2. Provide the name, address, phone number of the Facility's owner at the time of the spill.

RESPONSE: 380 SWR Norton LLC, c/o Calare Properties, Inc., 43 Broad Street, Hudson, MA 01749. PFS does not have access to the phone number for the owner of the Facility. PFS has communicated with Marcia Pereira, PM Realty Group, the Property Manager for the owner, 43 Broad Street, Suite C404, Hudson, MA 01749, 978-763-4103.

3. Provide the name, address, phone number of the Facility's operator at the time of the spill, if different from the owner.

RESPONSE: Preferred Freezer Services of Norton, LLC, 1 Main Street, Chatham, NJ 07928, 973-820-4467, was the operator of the Facility at the time of the ammonia release.

4. Provide the name, address, and phone number of any additional party that installed or provided maintenance to the tank from which the material spilled, and provide any documents relating to the permitting and licensing of the tank from which the material spilled.

RESPONSE:

Sysco Foods, address not known. Sysco was the prior owner and operator of the Facility.

American Refrigeration Company, Inc., 149 River Street, Suite 6, Andover, MA 01810, 978-474-4000. American Refrigeration is one of PFS's refrigeration maintenance contractors.

Recco Refrigeration Engineering & Contracting Co., Inc. 22 Sixth Road Woburn, MA 01801, 800-990-9423. Upon information and belief, Recco is one of the Facility owner's refrigeration maintenance contractors.

5. Provide the date the Facility first began operation and, if different, the date the current owner took over ownership of the Facility. If the Facility is operated by an entity other

than the owner, also include the date the current operator took over operation of the Facility.

RESPONSE: Preferred Freezer Services of Norton, LLC entered into a Lease with the owner on or about November 22, 2013. PFS is not aware of the date that the current owner, 380 SWR Norton LLC, took over possession from Sysco Foods, the prior owner of the Facility.

6. Provide a list of all the ammonia storage capacity at the Facility at the time of the spill, both underground and aboveground (including, tanks, drums, transformers, ammonia-filled systems, etc.) and the type of ammonia stored in each container. Indicate each container's age and method of construction (e.g., single or double wall, steel or fiberglass). Also indicate whether any secondary containment was provided around each container, and, if so, its method of construction and the total volume it can contain. Under 40 C.F.R. § 116.4, "ammonia" is defined as any isomer or hydrate of ammonia, as well as any solution or mixture containing the substance.

RESPONSE: See **Exhibit 2** attached and attached report of American Refrigeration dated December 19, 2013 (**Exhibit 3**). These exhibits provide information concerning the age and method of construction of the Subject Vessel and the ammonia charge in the refrigeration system as of December 2013. Anhydrous ammonia was the only type of ammonia used by PFS during the time that it operated at the Facility. No secondary containment was provided by the owner of the Facility around the Subject Vessel.

7. Provide a history of spill events at the Facility within the last five years (from the date of the spill in question). Explain the circumstances of each spill, the quantity of oil or hazardous material spilled, whether the oil or hazardous material reached any bodies of water and, if so, the names of such water bodies, and the quantity of oil or hazardous material entering such water bodies.

RESPONSE: Prior to the incident in question, there were no spill events at the Facility from the time that Preferred Freezer Services of Norton, LLC entered a Lease with the owner dated November 22, 2013. PFS has no knowledge of the history of spill events prior to its occupancy of the Facility.

8. Provide any additional information which you wish to bring to the attention of EPA.

RESPONSE: Preferred Freezer Services of Norton, LLC completely vacated the Facility in and around June 1, 2014. In addition, on June 19, 2014, Preferred Freezer Services of Norton, LLC shut down and pumped out all of the ammonia from the refrigeration system.

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I have also enclosed the original fully executed "Statement of Certification of Preferred Freezer Services of Norton, LLC. We trust that this responds to the Request for Information. Should you have any additional questions, please do not hesitate to contact me.

Very truly yours,

McELROY, DEUTSCH, MULVANEY & CARPENTER, LLP


JAMES D. RAY

cc: Jeff Kopf, Senior Enforcement Counsel, USEPA
Pamela Kapsimalis, Esq. (via email)
Mark Sens (via email)

Attachments:

Exhibit 1 - Letter Report of American Refrigeration Company, Inc. dated April 11, 2014

Exhibit 2 - Form U-1 Manufacturer's Data Report for Pressure Vessels

Exhibit 3 - Report of American Refrigeration dated December 19, 2013

Enclosures:

Statement of Certification for Preferred Freezer Services of Norton, LLC

Statement of Certification for Preferred Freezers Services of Norton, LLC

(To be returned with Response to Information Request)

I declare under penalty of perjury that I am authorized to respond on behalf of Preferred Freezer Services of Norton, LLC. I certify that the foregoing responses and information submitted were prepared under my direction or supervision and that I have personal knowledge of all matters set forth in the responses and the accompanying information. I certify that the responses are true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment. <

By: Em. Casey 9/11/2014
William Casey, General Manager
September , 2014

EXHIBIT 1



149 River Street, Suite 3 • Andover, MA 01810
Tel: 978 • 474 • 4000 Fax: 978 • 474 • 4001 Toll Free: 888 • 388 • 1120

April 11, 2014

Robert Walsh
Corporate Facilities Manager
Preferred Freezer Services
1 Main St 3rd Floor
Chatham, NJ 07928

Re: Preferred Freezer – Norton MA, Ammonia Release April 3, 2014

Dear Bob,

On Thursday, April 3, 2014 at 7:47 am, a Preferred Freezer employee called our technician Paul Ivanoski on his cell phone to report an Anhydrous Ammonia Release. Paul called American Refrigeration to report the release to the office as he prepared to respond to the site.

- Paul arrived on site at the Norton facility at 8:15am at the same time the local fire department was arriving. Paul requested a second American Refrigeration, Level A responder be dispatched to the location to prepare and assist with the release.
- Paul and the fire department personnel interviewed the Preferred Freezer employee to identify the events leading up to the release as they surveyed the scene to prevent unauthorized access.
- It was understood that the release originated from a spring loaded oil drain valve on an oil pot that allegedly failed in the open position.
- Because the potential leak exposure was unknown and the release was considered a Level A response, the fire department contacted the local hazmat team to respond.
- By the time the hazmat team arrived, it was clear that the release had stopped. The hazmat team donned the proper PPE and with instruction and direction from the Preferred Freezer and American Refrigeration staff, proceeded to approach the valve to confirm its position and to close the secondary isolation valve on the vessel.
- As the release dissipated to a safe level, American Refrigeration staff inspected the drain valve and found the valve mechanism to be coarse and hard to operate, hindering its operation. Additionally, there was evidence that the valve seat was not seating properly.
- New spring loaded drain valves were placed on order for both vessels and are scheduled to be installed upon receipt; expected 4/14/2014.
- The refrigeration system was brought back online late afternoon to full operation.
- It was later estimated based on a volume calculation that the estimated release was 2168 pounds of Anhydrous Ammonia.

Regards,

A handwritten signature in blue ink, appearing to read "Rob Morgo", is written over a faint, larger signature.

Rob Morgo
Service Manager
American Refrigeration Co. Inc.

American Refrigeration Company, Inc.

Norton Ammonia Release Calculation – April 3, 2014

The Sight Glass was on the 4th Indicator prior to the release and following the release it was at the 2.5 Indicator. There are 18 inches between the 2.5 Indicator and 4th indicator and each inch = 120 pounds. Total Release approximately 2160 pounds. (18X120 pounds).

This was calculated by Bob Walsh and American Refrigeration.

EXHIBIT 2

P.O. 205588

FORM U-1 MANUFACTURER'S DATA REPORT FOR PRESSURE VESSELS
As Required by the Provisions of the ASME Code Rules, Section VIII, Division 1

1. Manufactured and certified by: Refrigeration Valves And Systems Corporation, 1520 Crosswind Dr., Bryan, TX 77808

(Name and address of Manufacturer)

2. Manufactured for: NEWMACH COMPANIES, 14322-100 21ST. AVE. NORTH, PLYMOUTH, MN 55447

(Name and address of Purchaser)

3. Location of installation: HALLSMITH-SYSCO, 380 WORCHESTER ST., NORTON, MA

(Name and address)

4. Type: HORIZ.

(HORIZ, vert, or sphere)

10" X 30" OIL POT

(Tank, separator, jkt, vessel, heat exh, etc.)

42974

(Mfg's serial No.)

(CRN)

42974 REV.0

(Drawing No.)

20147

(Natl Bd No.)

2007

(Year built)

5. ASME Code, Section VIII, Div. 1

2004

2006

Edition and Addenda (date)

Code Case No.

Special Service per UG-120(d)

Items 6-11 incl. to be completed for single wall vessels, jackets of jacketed vessels, shell of heat exchangers, or chamber of multi-chamber vessels.

6. Shell (a) No. of course(s):

1

(b) Overall length (ft. & in.):

1' 10"

Course(s)			Material	Thickness		Long Joint (Cat. A)			Circum. Joint (Cat. A, B & C)			Heat Treatment	
No.	Out. Dia. in	Length (ft. & in.)	Spec./Grade or Type	Nom.	Corr.	Type	Full, Spot, None	Eff.	Type	Full, Spot, None	Eff.	Temp.	Time (hr)
1	10.75	1' 10"	SA106B	.365	0	S	NONE	85	2	NONE	65	---	---

7. Heads: (a) SA234 WPB

NO HT

(b) SAME

(Mat'l Spec. No., Grade or Type) H.T. - Time & Temp.

(Mat'l Spec. No., Grade or Type) H.T. - Time & Temp.

	Location (Top, Bottom, Ends)	Thickness		Radius		Elliptical Ratio	Conical Apex Angle	Hemispherical Radius	Flat Diameter	Side to Pressure (Convex or Concave)	Category A		
		Min	Corr	Crown	Knuckle						Type	Full, Spot, None	Eff
(a)	END	.319	0	---	---	2:1	---	---	---	CONCAVE	--	---	--
(b)	END	.319	0	---	---	2:1	---	---	---	CONCAVE	--	---	--

If removable, bolts used (describe other fastening)

(Mat'l Spec. No., Grade, Size, No.)

8. Type of jacket: ---

Jacket closure: ---

(Describe as u-bolts & weld, bar, etc.)

If bar, give dimensions: ---

If bolted, describe or sketch.

9. MAWP

300

(internal)

(external)

psi at max. temp.

+300

(internal)

(external)

°F Min. design metal temp.

-50

°f at

300

psi.

10. Impact test

NO UCS-66-b

(Indicate yes or no and the component(s) impact tested)

at test temperature of ---°F

11. Hydro., pneu., or comb. test press

390

Proof test: ---

Items 12 and 13 to be completed for tube sections

12. Tubesheet:

Stationary (Mat'l Spec. No.)

Dia. in. (subject to press)

Nom. thk. in.

Corr. Allow., in.

Attachment (welded or bolted)

Floating (Mat'l Spec. No.)

Dia. in.

Nom. thk. in.

Corr. Allow., in.

Attachment

13. Tubes:

Mat'l Spec. No., Grade or Type

O.D., in.

Nom. thk. in. or gauge

Number

Type (Straight or U)

Items 14-18 to be completed for inner chambers of jacketed vessels or channels of heat exchangers.

14. Shell (a) No. of course(s):

(b) Overall length (ft. & in.):

Course(s)			Material	Thickness		Long Joint (Cat. A)			Circum. Joint (Cat. A, B & C)			Heat Treatment	
No.	Out. Dia. in.	Length (ft. & in.)	Spec./Grade or Type	Nom.	Corr.	Type	Full, Spot, None	Eff.	Type	Full, Spot, None	Eff.	Temp.	Time (hr.)

15. Heads: (a)

(b) ---

(Mat'l Spec. No., Grade or Type) H.T. - Time & Temp.

(Mat'l Spec. No., Grade or Type) H.T. - Time & Temp.

	Location (Top, Bottom, Ends)	Thickness		Radius		Elliptical Ratio	Conical Apex Angle	Hemispherical Radius	Flat Diameter	Side to Pressure (Convex or Concave)	Category A		
		Min.	Corr.	Crown	Knuckle						Type	Full Spot, None	Eff.
(a)				---	---	---	---	---			---	---	---
(b)													

If removable, bolts used (describe other fastening)

(Mat'l Spec. No., Grade, Size, No.)

16. MAWP P --- --- psi at max. temp. --- --- °F Min. design metal temp. --- °F at --- psi.
(internal) (external) (internal) (external)

17. Impact test --- at test temperature of ---
(Indicate yes or no and the component(s) impact tested)

18. Hydro, pneu, or comb. test press. --- Proof test ---

19. Nozzles, inspection, and safety valve openings

Purpose (Inlet (Outlet, Drain, etc.))	No	Diameter or Size	Flange Type	Material		Nozzle Thickness		Reinforcement Material	How Attached		Location (Insp. Open.)
				Nozzle	Flange	Nom	Corr		Nozzle	Flange	
MISC.	1,2	2,3/4	---	SA106B	---	S/80	0	INHERENT	*	---	
RELIEF	1	1/2	---	SA105	---	3000#	0	INHERENT	*	---	

20. Supports: Skirt NO Lugs 0 Legs 0 Others 2 SADDLES Attached WELDED TO SHELL
(Yes or no) (No) (No) (Describe) (Where and how)

21. Manufacturer's Partial Data Reports properly identified and signed by Commissioned Inspectors have been furnished for the following items of the report:
 (List the name of part, item number, mfg's name and identifying number)

N/A

22. Remarks: PRESSURE RELIEF DEVICE SUPPLIED BY OTHERS.

* WELDED IN ACCORDANCE WITH FABRICATION DRAWING.
FOR NON-LETHAL, NON-CORROSIVE SERVICE.

CERTIFICATE OF SHOP COMPLIANCE

We certify that the statements made in this report are correct and that all details of design, material, construction, and workmanship of this vessel conform to the ASME Code for Pressure Vessels, Section VIII, Division 1.

U Certificate of Authorization No.

18912

Expires Oct. 10, 2010

Date 11-23-07

Name

Refrigeration Valves and Systems Corporation

Signed

(Manufacturer)

(Representative)

CERTIFICATE OF SHOP INSPECTION

I, the undersigned, holding a valid commission issued by the National Board of Boiler and Pressure Vessel Inspectors and/or the State or Province of TEXAS and employed by Onebeacon America Insurance Company of Boston, MA have inspected the

pressure vessel described in this Manufacturer's Data Report on 11-15, 20 07, and state that, to the best of my knowledge and belief, the Manufacturer has constructed this pressure vessel in accordance with ASME Code, Section VIII, Division 1. By signing this certificate neither the Inspector nor his employer makes any warranty, expressed or implied, concerning the pressure vessel described in this Manufacturer's Data Report. Furthermore, neither the Inspector nor his employer shall be liable in any manner for any personal injury or property damage or a loss of any kind arising from or connected with this inspection.

Date 11-26-07 Signed

[Signature]

(Authorized Inspector)

Commissions

SB#12355A, TX1681
 (Natl Board incl. Endorsement, State, Province and No.)

CERTIFICATE OF FIELD ASSEMBLY COMPLIANCE

We certify that the statements on this report are correct and that the field assembly construction of all parts of this vessel conforms with the requirements of ASME Code, Section VIII, Division 1.

U Certificate of Authorization No.

Expires

, 20

Date

Name

Signed

(Assembler)

(Representative)

CERTIFICATE OF FIELD ASSEMBLY INSPECTION

I the undersigned, holding a valid commission issued by the National Board of Boiler and Pressure Vessel Inspectors and/or the State or Province of _____ and employed by _____ of _____ have compared the statements in this Manufacturer's Data Report with the described pressure vessel and state that the parts referred to as data items _____, not included in the certificate of shop inspection, have been inspected by me and to the best of my knowledge and belief, the Manufacturer has constructed and assembled this pressure vessel in accordance with ASME Code, Section VIII, Division 1. The described vessel was inspected and subjected to a hydrostatic test of _____ psi. By signing this certificate neither the Inspector nor his employer makes any warranty, express or implied, concerning the pressure vessel described in this Manufacturer's Data Report. Furthermore, neither the Inspector nor his employer shall be liable in any manner for any personal injury or property damage or a loss of any kind arising from or connected with this inspection.

Date _____ Signed

[Signature]

(Authorized Inspector)

Commissions

(Natl Board incl. Endorsement, State, Province and No.)

EXHIBIT 3



149 River Street, Suite 3 • Andover, MA 01810
Tel: 978 • 474 • 4000 Fax: 978 • 474 • 4001 Toll Free: 888 • 388 • 1120

Preferred Freezer
380 S. Worcester Street
Norton, MA

12/19/13

Re: Plant ammonia charge calculations

On December 14th, 2013 American Refrigeration performed a survey of your plant to determine the specific ammonia charge currently in your ammonia system. As part of this survey we employed the following methodology.

1. We shut down the ammonia pumps feeding the plant and allowed the compressors to run for approximately 2 hours. This allowed all the ammonia in the evaporators and piping out in the plant to be pumped back to the vessels in the engine room.
2. We then observed and recorded the operating levels and pressure's in all the vessels in the plant and recorded each level.
3. We measured and recorded the linear length and size of all high pressure liquid feed lines from the high pressure receiver to each piece of equipment that would still contain liquid ammonia that would not have been pumped out during the pump down process.
4. We next measured and recorded the linear length and size of the pumped liquid feed lines from the recirculation vessel to each piece of equipment that were still partially full.
5. We recorded the operating conditions of each specific piece of equipment noted above at the time the information was gathered.

Using this information we then applied engineering calculations based on specific volume of vapor and density of liquid at each specific operating condition recorded.

1. For the vessels we used the Industrial Refrigeration Consortium (IRC) vessel charge estimator program to calculate the ammonia charge in pounds based on the actual levels we observed during our survey
2. For the high pressure liquid feed lines we converted the linear feet of each size pipes internal volume to cubic feet. We then multiplied the cubic feet times the pounds of ammonia per cubic foot times the percentage the line was full at the recorded temperature observed during our survey.
3. We employed the same methods for the pumped liquid feed lines as with the high pressure liquid feed lines.
4. For the remaining vapor piping and equipment where we could not get specific information we added 10% to the total liquid charge figured from the methods described above. This is generally accepted to be more than adequate to account for any remaining refrigerant in the vapor side of the piping.

Based on our survey and these methods of calculation your plant charge is – 28,538#

American Refrigeration Company, Inc.

Please see the attached documentation in support of these findings.

Thank you for allowing us the opportunity to service all of your Industrial Refrigeration needs. If you have any question please do not hesitate to contact me.

Regards,

A handwritten signature in black ink, appearing to read "David Overlan". The signature is fluid and cursive, with a long horizontal stroke at the end.

David Overlan
Sales Engineer
American Refrigeration Co. Inc.

CC: Dave McCowan

American Refrigeration Company, Inc.



Horizontal Refrigeration Vessel Charge Estimator

Industrial Refrigeration Consortium

University of Wisconsin—Madison



Head type = 2:1 Ellipsoidal

Local atmospheric pressure = 14.7 psia

ammonia Specify Saturation Temperature T = 20 F
p = 33.51 psig

High Level = Alarm = 70 in

Normal Operating Level = 33 in

Low Level Alarm = 4 in

Diameter = 84 in

Total Length = 165 in

Input Help

Choose Different Orientation

Calculate Summary Version 1.2 3/10/09
Calculation Date = 12/18/2013

Facility Name Preferred Freezer Location Norton MA

Description

Vessel Name Medium Temp Pump package

Vessel ID MTPP

National Board Number 20153

Normal Operating Charge and Vessel Volume Output

$m_{\text{vapor}} = 52.65 \text{ [lb}_m\text{]}$	23.88 [kg]	$D = 7 \text{ [ft]}$	2.134 [m]
$m_{\text{liquid}} = 7057 \text{ [lb}_m\text{]}$	3201 [kg]	$L_{\text{total}} = 13.75 \text{ [ft]}$	4.191 [m]
$m_{\text{total}} = 7109 \text{ [lb}_m\text{]}$	3225 [kg]	$V_{\text{total}} = 3623 \text{ gal}$	$13.71 \text{ [m}^3\text{]}$

Maximum Operating Charge	Surge & Ballast Volumes
$m_{\text{HL, total}} = 17573 \text{ [lb}_m\text{]}$ 7971 [kg]	$V_{\text{surge}} = 1944 \text{ gal}$ 7.359 [m ³]
	$V_{\text{ballast}} = 1250 \text{ gal}$ 4.731 [m ³]

SOLUTION

Unit Settings: Eng F psia mass rad

$$A_{\text{cylinder}} = 38.48 \text{ [ft}^2\text{]}$$

$$A_{\text{HL,v}} = 4.216 \text{ [ft}^2\text{]}$$

$$A_{\text{LL,v}} = 37.82$$

$$A_v = 24.45 \text{ [ft}^2\text{]}$$

$$\text{BoardNumber\$} = '20153'$$

$$D = 7 \text{ [ft]}$$

DH = 3.5 [ft]
 DUNIT\$ = 'in'
 D_{input} = 84
 D_m = 2.134 [m]
 FacilityLocation\$ = 'Norton MA'
 FacilityName\$ = 'Preferred Freezer'
 H = 2.75 [ft]
 HHLUNIT\$ = 'in'
 HLLUNIT\$ = 'in'
 HR = 2
 HUNIT\$ = 'in'
 H_{HL} = 5.833 [ft]
 H_{HL, input} = 70
 H_{input} = 33
 H_{LL} = 0.3333
 H_{LL, input} = 4
 LUNIT\$ = 'in'
 L_{cylinder} = 10.25 [ft]
 L_{input} = 165
 L_{total} = 13.75 [ft]
 L_{total, m} = 4.191 [m]
 m_{HL, liquid} = 17564 [lb_m]
 m_{HL, total} = 17573 [lb_m]
 m_{HL, total, m} = 7971 [kg]
 m_{HL, vapor} = 8.477 [lb_m]
 m_{liquid} = 7057 [lb_m]
 m_{liquid, m} = 3201 [kg]
 m_{total} = 7109 [lb_m]
 m_{total, m} = 3225 [kg]
 m_{vapor} = 52.65 [lb_m]
 m_{vapor, m} = 23.88 [kg]
 p = 33.51
 POUNIT\$ = 'psia'
 PUNIT\$ = 'psig'
 p₀ = 14.7 [psia]
 p_{0, input} = 14.7
 p_{abs} = 48.21 [psia]
 p_{conversion} = 1
 R\$ = 'ammonia'
 ρ_L = 40.43 [lb_m/ft³]
 ρ_V = 0.17 [lb_m/ft³]
 Specifystate\$ = 'Specify Saturation Temperature // T_input=?'
 T = 20 [F]
 Today\$ = '12/18/2013'
 TUNIT\$ = 'F'
 T_{input} = 20
 Version\$ = 'Version 1.2 3/10/09'
 VesselID\$ = 'MTPP'
 VesselName\$ = 'Medium Temp Pump package'
 VUNIT\$ = 'gal'
 V_{ballast} = 1250
 V_{ballast, m} = 4.731 [m³]
 V_{cylinder, HLL} = 351.3 [ft³]
 V_{cylinder, HL, V} = 43.21 [ft³]
 V_{cylinder, L} = 143.8 [ft³]

$V_{\text{cylinder,LL,L}} = 6.858$
 $V_{\text{cylinder,LL,V}} = 387.6$
 $V_{\text{cylinder,V}} = 250.6 \text{ [ft}^3\text{]}$
 $V_{\text{head,H,L,L}} = 83.15 \text{ [ft}^3\text{]}$
 $V_{\text{head,H,L,V}} = 6.652 \text{ [ft}^3\text{]}$
 $V_{\text{head,L}} = 30.69 \text{ [ft}^3\text{]}$
 $V_{\text{head,L,L,L}} = 0.5915$
 $V_{\text{head,L,L,V}} = 89.21$
 $V_{\text{head,V}} = 59.11 \text{ [ft}^3\text{]}$
 $V_{\text{surge}} = 1944$
 $V_{\text{surge,m}} = 7.359 \text{ [m}^3\text{]}$
 $V_{\text{total}} = 3623$
 $V_{\text{total,H,L,L}} = 434.4 \text{ [ft}^3\text{]}$
 $V_{\text{total,H,L,V}} = 49.87 \text{ [ft}^3\text{]}$
 $V_{\text{total,L}} = 174.5 \text{ [ft}^3\text{]}$
 $V_{\text{total,L,L,L}} = 7.45$
 $V_{\text{total,L,L,V}} = 476.8$
 $V_{\text{total,m}} = 13.71 \text{ [m}^3\text{]}$
 $V_{\text{total,V}} = 309.7 \text{ [ft}^3\text{]}$



Horizontal Refrigeration Vessel Charge Estimator

Industrial Refrigeration Consortium
University of Wisconsin--Madison

www.irc.wisc.edu

Head type = 2 : 1 Ellipsoidal

Local atmospheric pressure = 14.7 psia

ammonia Specify Saturation Temperature T = 20 F
p = 33.51 psig

High Level = Alarm = 50 in

Normal Operating Level = 40 in

Low Level Alarm = 4 in

Diameter = 60 in

Total Length = 153 in

? Input Help

Choose Different Orientation

Calculate		Summary		Version 1.2 3/10/09	
				Calculation Date = 12/19/2013	
Facility Name	Preferred Freezer	Location	Norton MA		
Description					
Vessel Name	Low temp Pump package				
Vessel ID	LTTP				
National Board Number	20152				
Normal Operating Charge and Vessel Volume Output					
$m_{\text{vapor}} = 11.43 \text{ [lb}_m\text{]}$	5.182 [kg]	D = 5 [ft]	1.524 [m]		
$m_{\text{liquid}} = 6743 \text{ [lb}_m\text{]}$	3059 [kg]	$L_{\text{total}} = 12.75 \text{ [ft]}$	3.886 [m]		
$m_{\text{total}} = 6755 \text{ [lb}_m\text{]}$	3064 [kg]	$V_{\text{total}} = 1750 \text{ [gal]}$	6.626 [m ³]		
Maximum Operating Charge			Surge & Ballast Volumes		
$m_{\text{HL, total}} = 8475 \text{ [lb}_m\text{]}$	3844 [kg]	$V_{\text{surge}} = 319.7 \text{ [gal]}$	1.21 [m ³]		
		$V_{\text{ballast}} = 1201 \text{ [gal]}$	4.548 [m ³]		

SOLUTION

Unit Settings: Eng F psia mass rad

$$A_{\text{cylinder}} = 19.63 \text{ [ft}^2\text{]}$$

$$A_{\text{HL, v}} = 2.151 \text{ [ft}^2\text{]}$$

$$A_{\text{LL, v}} = 19.07$$

$$A_v = 5.729 \text{ [ft}^2\text{]}$$

$$\text{BoardNumber\$} = '20152'$$

$$D = 5 \text{ [ft]}$$

$$DH = 2.5 \text{ [ft]}$$

DUNIT\$ = 'in'
 $D_{input} = 60$
 $D_m = 1.524 \text{ [m]}$
 FacilityLocation\$ = 'Norton MA'
 FacilityName\$ = 'Preferred Freezer'
 $H = 3.333 \text{ [ft]}$
 HHLUNIT\$ = 'in'
 HLLUNIT\$ = 'in'
 $HR = 2$
 HUNIT\$ = 'in'
 $H_{HL} = 4.167 \text{ [ft]}$
 $H_{HL,input} = 50$
 $H_{input} = 40$
 $H_{LL} = 0.3333$
 $H_{LL,input} = 4$
 LUNIT\$ = 'in'
 $L_{cylinder} = 10.25 \text{ [ft]}$
 $L_{input} = 153$
 $L_{total} = 12.75 \text{ [ft]}$
 $L_{total,m} = 3.886 \text{ [m]}$
 $m_{HL,liquid} = 8471 \text{ [lb}_m\text{]}$
 $m_{HL,total} = 8475 \text{ [lb}_m\text{]}$
 $m_{HL,total,m} = 3844 \text{ [kg]}$
 $m_{HL,vapor} = 4.16 \text{ [lb}_m\text{]}$
 $m_{liquid} = 6743 \text{ [lb}_m\text{]}$
 $m_{liquid,m} = 3059 \text{ [kg]}$
 $m_{total} = 6755 \text{ [lb}_m\text{]}$
 $m_{total,m} = 3064 \text{ [kg]}$
 $m_{vapor} = 11.43 \text{ [lb}_m\text{]}$
 $m_{vapor,m} = 5.182 \text{ [kg]}$
 $p = 33.51$
 PUNIT\$ = 'psia'
 PUNIT\$ = 'psig'
 $p_0 = 14.7 \text{ [psia]}$
 $p_{0,input} = 14.7$
 $p_{abs} = 48.21 \text{ [psia]}$
 $p_{conversion} = 1$
 R\$ = 'ammonia'
 $\rho_L = 40.43 \text{ [lb}_m\text{/ft}^3\text{]}$
 $\rho_V = 0.17 \text{ [lb}_m\text{/ft}^3\text{]}$
 Specifystate\$ = 'Specify Saturation Temperature // T_input=?'
 $T = 20 \text{ [F]}$
 Today\$ = '12/19/2013'
 TUNIT\$ = 'F'
 $T_{input} = 20$
 Version\$ = 'Version 1.2 3/10/09'
 VesselID\$ = 'LTPP'
 VesselName\$ = 'Low temp Pump package'
 VUNIT\$ = 'gal'
 $V_{ballast} = 1201$
 $V_{ballast,m} = 4.548 \text{ [m}^3\text{]}$
 $V_{cylinder,HLL} = 179.2 \text{ [ft}^3\text{]}$
 $V_{cylinder,HLL,V} = 22.05 \text{ [ft}^3\text{]}$
 $V_{cylinder,L} = 142.5 \text{ [ft}^3\text{]}$

$V_{\text{cylinder,LL,L}} = 5.762$
 $V_{\text{cylinder,LL,V}} = 195.5$
 $V_{\text{cylinder,V}} = 58.73 \text{ [ft}^3\text{]}$
 $V_{\text{head,HL,L}} = 30.3 \text{ [ft}^3\text{]}$
 $V_{\text{head,HL,V}} = 2.424 \text{ [ft}^3\text{]}$
 $V_{\text{head,L}} = 24.24 \text{ [ft}^3\text{]}$
 $V_{\text{head,LL,L}} = 0.4169$
 $V_{\text{head,LL,V}} = 32.31$
 $V_{\text{head,V}} = 8.484 \text{ [ft}^3\text{]}$
 $V_{\text{surge}} = 319.7$
 $V_{\text{surge,m}} = 1.21 \text{ [m}^3\text{]}$
 $V_{\text{total}} = 1750$
 $V_{\text{total,HL,L}} = 209.5 \text{ [ft}^3\text{]}$
 $V_{\text{total,HL,V}} = 24.47 \text{ [ft}^3\text{]}$
 $V_{\text{total,L}} = 166.8 \text{ [ft}^3\text{]}$
 $V_{\text{total,LL,L}} = 6.179$
 $V_{\text{total,LL,V}} = 227.8$
 $V_{\text{total,m}} = 6.626 \text{ [m}^3\text{]}$
 $V_{\text{total,V}} = 67.21 \text{ [ft}^3\text{]}$



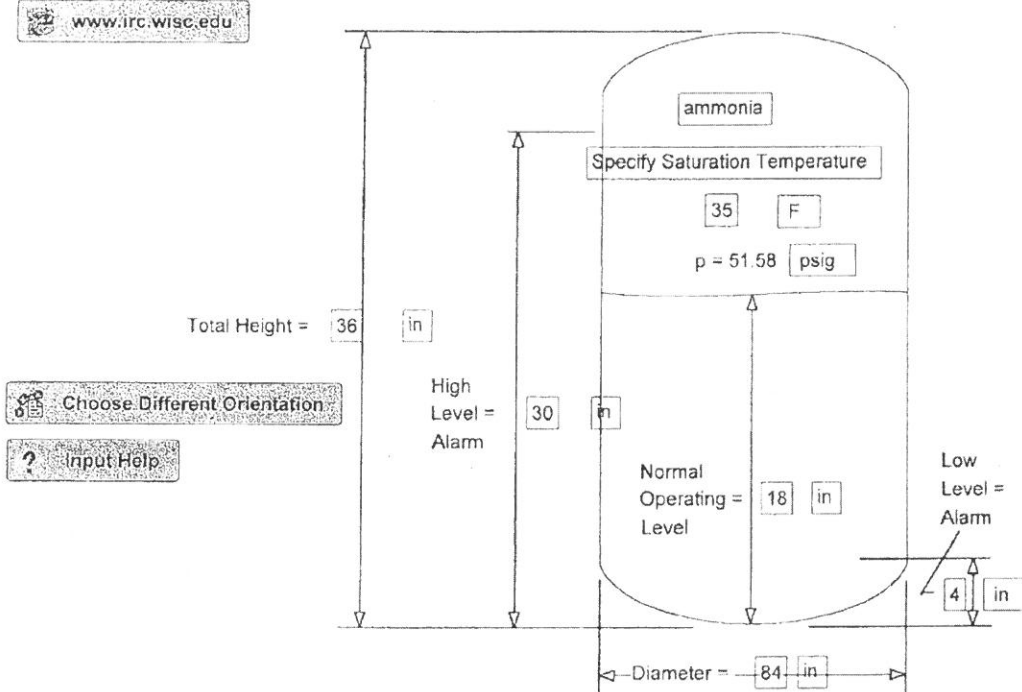
Vertical Refrigeration Vessel Charge Estimator

Industrial Refrigeration Consortium
University of Wisconsin--Madison

www.irc.wisc.edu

Head type = 2 :1 Ellipsoidal

Local atmospheric pressure = 14.7 psia



Calculate

Summary

Version 1.2 3/10/09

Calculation Date = 12/19/2013

Facility Name Preferred Freezer

Location Norton MA

Description

Vessel Name Thermosiphon Vessel

Vessel ID TSV

National Board Number 20151

Operating Charge and Vessel Volume Output

$m_{\text{vapor}} = 8.091 \text{ [lb}_m\text{]}$	3.67 [kg]	D = 7 [ft]	2.134
$m_{\text{liquid}} = 1404 \text{ [lb}_m\text{]}$	636.9 [kg]	$L_{\text{total}} = 3 \text{ [ft]}$	0.9144 [m]
$m_{\text{total}} = 1412 \text{ [lb}_m\text{]}$	640.6 [kg]	$V_{\text{total}} = 527.8 \text{ gal}$	1.998 [m ³]

Maximum Charge

$m_{\text{total,HL}} = 2607 \text{ [lb}_m\text{]}$ 1182 [kg]

Surge & Ballast Volume

$V_{\text{surge}} = 226.2 \text{ gal}$ 0.8562 [m³]

$V_{\text{ballast}} = 247.3 \text{ gal}$ 0.936 [m³]

SOLUTION

Unit Settings: Eng F psia mass rad

$A_{cylinder} = 38.48 \text{ [ft}^2\text{]}$

BoardNumber\$ = '20151'

$D = 7 \text{ [ft]}$

$DH = 3.5 \text{ [ft]}$

DUNIT\$ = 'in'

$D_{input} = 84$

$D_m = 2.134$

FacilityName\$ = 'Preferred Freezer'

FacilityLocation\$ = 'Norton MA'

$H = 1.5 \text{ [ft]}$

HHLUNIT\$ = 'in'

HLLUNIT\$ = 'in'

HR = 2

HUNIT\$ = 'in'

$H_{HL} = 2.5 \text{ [ft]}$

$H_{HL,input} = 30$

$H_{input} = 18$

$H_{LL} = 0.3333$

$H_{LL,input} = 4$

LUNIT\$ = 'in'

$L_{cylinder,HL,L} = -0.5 \text{ [ft]}$

$L_{cylinder,HL,V} = 0 \text{ [ft]}$

$L_{cylinder,L} = 0 \text{ [ft]}$

$L_{cylinder,LL,L} = 0$

$L_{cylinder,LL,V} = -0.5$

$L_{cylinder,V} = -0.5 \text{ [ft]}$

$L_{input} = 36$

$L_{total} = 3 \text{ [ft]}$

$L_{total,m} = 0.9144 \text{ [m]}$

$m_{liquid} = 1404 \text{ [lb}_m\text{]}$

$m_{liquid,HL} = 2605 \text{ [lb}_m\text{]}$

$m_{liquid,m} = 636.9 \text{ [kg]}$

$m_{total} = 1412 \text{ [lb}_m\text{]}$

$m_{total,HL} = 2607 \text{ [lb}_m\text{]}$

$m_{total,HL,m} = 1182 \text{ [kg]}$

$m_{total,m} = 640.6 \text{ [kg]}$

$m_{vapor} = 8.091 \text{ [lb}_m\text{]}$

$m_{vapor,HL} = 1.143 \text{ [lb}_m\text{]}$

$m_{vapor,m} = 3.67 \text{ [kg]}$

$p = 51.58 \text{ [psig]}$

PUNIT\$ = 'psia'

PUNIT\$ = 'psig'

$p_0 = 14.7 \text{ [psia]}$

$p_{0,input} = 14.7$

R\$ = 'ammonia'

$\rho_L = 39.73 \text{ [lb}_m\text{/ft}^3\text{]}$

$\rho_V = 0.2298 \text{ [lb}_m\text{/ft}^3\text{]}$

Specifystate\$ = 'Specify Saturation Temperature // T_input=?'

$T = 35 \text{ [F]}$

Today\$ = '12/19/2013'

TUNIT\$ = 'F'

$T_{input} = 35$
Version\$ = 'Version 1.2 3/10/09'
VesselID\$ = 'TSV'
VesselName\$ = 'Thermosiphon Vessel'
VUNIT\$ = 'gal'
 $V_{ballast} = 247.3$
 $V_{ballast,m} = 0.936 \text{ [m}^3\text{]}$
 $V_{cylinder,HLL} = -19.24 \text{ [ft}^3\text{]}$
 $V_{cylinder,HLL,V} = 0 \text{ [ft}^3\text{]}$
 $V_{cylinder,L} = 0 \text{ [ft}^3\text{]}$
 $V_{cylinder,L,L} = 0$
 $V_{cylinder,L,L,V} = -19.24$
 $V_{cylinder,V} = -19.24 \text{ [ft}^3\text{]}$
 $V_{head,HLL} = 84.82 \text{ [ft}^3\text{]}$
 $V_{head,HLL,V} = 4.974 \text{ [ft}^3\text{]}$
 $V_{head,L} = 35.34 \text{ [ft}^3\text{]}$
 $V_{head,L,L} = 2.288$
 $V_{head,L,L,V} = 87.51$
 $V_{head,V} = 54.45 \text{ [ft}^3\text{]}$
 $V_{surge} = 226.2$
 $V_{surge,m} = 0.8562 \text{ [m}^3\text{]}$
 $V_{total} = 527.8 \text{ [ft}^3\text{]}$
 $V_{total,HLL} = 65.58 \text{ [ft}^3\text{]}$
 $V_{total,HLL,V} = 4.974 \text{ [ft}^3\text{]}$
 $V_{total,L} = 35.34 \text{ [ft}^3\text{]}$
 $V_{total,L,L} = 2.288$
 $V_{total,m} = 1.998 \text{ [m}^3\text{]}$
 $V_{total,V} = 35.21 \text{ [ft}^3\text{]}$
Warning\$ = ''



Horizontal Refrigeration Vessel Charge Estimator

Industrial Refrigeration Consortium
University of Wisconsin-Madison



Head type = 2:1 Ellipsoidal

Local atmospheric pressure = 14.7 psia

ammonia Specify Saturation Temperature T = -20 F
p = 3.575 psig

High Level = 8 in
Normal Operating Level = 8 in
Low Level Alarm = 4 in
Diameter = 8 in
Total Length = 28 in

? Input Help
Choose Different Orientation

Calculate **Summary** Version 1.2 3/10/09
Calculation Date = 12/19/2013

Facility Name Preferred Freezer Location Norton MA

Description

Vessel Name LTPP oil pot
Vessel ID OP 1
National Board Number NA

Normal Operating Charge and Vessel Volume Output

$m_{\text{vapor}} = 0 \text{ [lb}_m\text{]}$	0 [kg]	$D = 0.6667 \text{ [ft]}$	0.2032 [m]
$m_{\text{liquid}} = 32.75 \text{ [lb}_m\text{]}$	14.86 [kg]	$L_{\text{total}} = 2.333 \text{ [ft]}$	0.7112 [m]
$m_{\text{total}} = 32.75 \text{ [lb}_m\text{]}$	14.86 [kg]	$V_{\text{total}} = 5.803 \text{ gal}$	$0.02197 \text{ [m}^3\text{]}$

Maximum Operating Charge

$m_{\text{HL, total}} = 32.75 \text{ [lb}_m\text{]}$	14.86 [kg]
--	----------------------

Surge & Ballast Volumes

$V_{\text{surge}} = 0 \text{ gal}$	$0 \text{ [m}^3\text{]}$
$V_{\text{ballast}} = 2.901 \text{ gal}$	$0.01098 \text{ [m}^3\text{]}$

SOLUTION

Unit Settings: Eng F psia mass rad

$$A_{\text{cylinder}} = 0.3491 \text{ [ft}^2\text{]}$$

$$A_{\text{HL, V}} = 0 \text{ [ft}^2\text{]}$$

$$A_{\text{LL, V}} = 0.1745$$

$$A_v = 0 \text{ [ft}^2\text{]}$$

$$\text{BoardNumber\$} = \text{'NA'}$$

$$D = 0.6667 \text{ [ft]}$$

$$DH = 0.3333 \text{ [ft]}$$

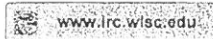
DUNIT\$ = 'in'
 D_{input} = 8
 D_m = 0.2032 [m]
 FacilityLocation\$ = 'Norton MA'
 FacilityName\$ = 'Preferred Freezer'
 H = 0.6667 [ft]
 HHLUNIT\$ = 'in'
 HLLUNIT\$ = 'in'
 HR = 2
 HUNIT\$ = 'in'
 H_{HL} = 0.6667 [ft]
 H_{HL, input} = 8
 H_{input} = 8
 H_{LL} = 0.3333
 H_{LL, input} = 4
 LUNIT\$ = 'in'
 L_{cylinder} = 2 [ft]
 L_{input} = 28
 L_{total} = 2.333 [ft]
 L_{total, m} = 0.7112 [m]
 m_{HL, liquid} = 32.75 [lb_m]
 m_{HL, total} = 32.75 [lb_m]
 m_{HL, total, m} = 14.86 [kg]
 m_{HL, vapor} = 0 [lb_m]
 m_{liquid} = 32.75 [lb_m]
 m_{liquid, m} = 14.86 [kg]
 m_{total} = 32.75 [lb_m]
 m_{total, m} = 14.86 [kg]
 m_{vapor} = 0 [lb_m]
 m_{vapor, m} = 0 [kg]
 p = 3.575
 PUNIT\$ = 'psia'
 PUNIT\$ = 'psig'
 p₀ = 14.7 [psia]
 p_{0, input} = 14.7
 p_{abs} = 18.28 [psia]
 p_{conversion} = 1
 RS = 'ammonia'
 ρ_L = 42.22 [lb_m/ft³]
 ρ_V = 0.06826 [lb_m/ft³]
 Specifystate\$ = 'Specify Saturation Temperature // T_{input}=?'
 T = -20 [F]
 Today\$ = '12/19/2013'
 TUNIT\$ = 'F'
 T_{input} = -20
 Version\$ = 'Version 1.2 3/10/09'
 VesselID\$ = 'OP 1'
 VesselName\$ = 'LTPP oil pot'
 VUNIT\$ = 'gal'
 V_{ballast} = 2.901
 V_{ballast, m} = 0.01098 [m³]
 V_{cylinder, HL, L} = 0.6981 [ft³]
 V_{cylinder, HL, V} = 0 [ft³]
 V_{cylinder, L} = 0.6981 [ft³]

$V_{\text{cylinder,LL,L}} = 0.3491$
 $V_{\text{cylinder,LL,V}} = 0.3491$
 $V_{\text{cylinder,V}} = 0 \text{ [ft}^3\text{]}$
 $V_{\text{head,HLL}} = 0.07757 \text{ [ft}^3\text{]}$
 $V_{\text{head,HLL,V}} = 0 \text{ [ft}^3\text{]}$
 $V_{\text{head,L}} = 0.07757 \text{ [ft}^3\text{]}$
 $V_{\text{head,LL,L}} = 0.03879$
 $V_{\text{head,LL,V}} = 0.03879$
 $V_{\text{head,V}} = 0 \text{ [ft}^3\text{]}$
 $V_{\text{surge}} = 0$
 $V_{\text{surge,m}} = 0 \text{ [m}^3\text{]}$
 $V_{\text{total}} = 5.803$
 $V_{\text{total,HLL}} = 0.7757 \text{ [ft}^3\text{]}$
 $V_{\text{total,HLL,V}} = 0 \text{ [ft}^3\text{]}$
 $V_{\text{total,L}} = 0.7757 \text{ [ft}^3\text{]}$
 $V_{\text{total,LL,L}} = 0.3879$
 $V_{\text{total,LL,V}} = 0.3879$
 $V_{\text{total,m}} = 0.02197 \text{ [m}^3\text{]}$
 $V_{\text{total,V}} = 0 \text{ [ft}^3\text{]}$



Horizontal Refrigeration Vessel Charge Estimator

Industrial Refrigeration Consortium
University of Wisconsin--Madison



Head type = 2:1 Ellipsoidal

Local atmospheric pressure = 14.7 psia

ammonia Specify Saturation Temperature T = 20 F
p = 33.51 psig

High Level = 8 in
Normal Operating Level = 8 in
Low Level Alarm = 4 in
Diameter = 8 in
Total Length = 28 in

? Input Help
Choose Different Orientation

Calculate **Summary** Version 1.2 3/10/09
Calculation Date = 12/19/2013

Facility Name Preferred Freezer Location Norton MA

Description

Vessel Name MTPP oil pot
Vessel ID OP2
National Board Number NA

Normal Operating Charge and Vessel Volume Output

$m_{\text{vapor}} = 0 \text{ [lb}_m\text{]}$	0 [kg]	$D = 0.6667 \text{ [ft]}$	0.2032 [m]
$m_{\text{liquid}} = 31.36 \text{ [lb}_m\text{]}$	14.23 [kg]	$L_{\text{total}} = 2.333 \text{ [ft]}$	0.7112 [m]
$m_{\text{total}} = 31.36 \text{ [lb}_m\text{]}$	14.23 [kg]	$V_{\text{total}} = 5.803 \text{ [gal]}$	$0.02197 \text{ [m}^3\text{]}$

Maximum Operating Charge	Surge & Ballast Volumes
$m_{\text{HL, total}} = 31.36 \text{ [lb}_m\text{]}$ 14.23 [kg]	$V_{\text{surge}} = 0 \text{ gal}$ $0 \text{ [m}^3\text{]}$
	$V_{\text{ballast}} = 2.901 \text{ gal}$ $0.01098 \text{ [m}^3\text{]}$

SOLUTION

Unit Settings: Eng F psia mass rad

$$A_{\text{cylinder}} = 0.3491 \text{ [ft}^2\text{]}$$

$$A_{\text{HL, v}} = 0 \text{ [ft}^2\text{]}$$

$$A_{\text{LL, v}} = 0.1745$$

$$A_v = 0 \text{ [ft}^2\text{]}$$

$$\text{BoardNumber\$} = \text{'NA'}$$

$$D = 0.6667 \text{ [ft]}$$

$$DH = 0.3333 \text{ [ft]}$$

DUNIT\$\$ = 'in'
 D_{input} = 8
 D_m = 0.2032 [m]
 FacilityLocation\$ = 'Norton MA'
 FacilityName\$ = 'Preferred Freezer'
 H = 0.6667 [ft]
 HHLUNITSS = 'in'
 HLLUNITSS = 'in'
 HR = 2
 HUNITSS = 'in'
 H_{HL} = 0.6667 [ft]
 H_{HL, input} = 8
 H_{input} = 8
 H_{LL} = 0.3333
 H_{LL, input} = 4
 LUNITSS = 'in'
 L_{cylinder} = 2 [ft]
 L_{input} = 28
 L_{total} = 2.333 [ft]
 L_{total, m} = 0.7112 [m]
 m_{HL, liquid} = 31.36 [lb_m]
 m_{HL, total} = 31.36 [lb_m]
 m_{HL, total, m} = 14.23 [kg]
 m_{HL, vapor} = 0 [lb_m]
 m_{liquid} = 31.36 [lb_m]
 m_{liquid, m} = 14.23 [kg]
 m_{total} = 31.36 [lb_m]
 m_{total, m} = 14.23 [kg]
 m_{vapor} = 0 [lb_m]
 m_{vapor, m} = 0 [kg]
 p = 33.51
 POUNITSS = 'psia'
 PUNITSS = 'psig'
 p₀ = 14.7 [psia]
 p_{0, input} = 14.7
 p_{abs} = 48.21 [psia]
 p_{conversion} = 1
 R\$ = 'ammonia'
 ρ_L = 40.43 [lb_m/ft³]
 ρ_V = 0.17 [lb_m/ft³]
 Specifystate\$ = 'Specify Saturation Temperature // T_input=?'
 T = 20 [F]
 Today\$ = '12/19/2013'
 TUNITSS = 'F'
 T_{input} = 20
 Version\$ = 'Version 1.2 3/10/09'
 VesselID\$ = 'OP2'
 VesselName\$ = 'MTPP oil pot'
 VUNITSS = 'gal'
 V_{ballast} = 2.901
 V_{ballast, m} = 0.01098 [m³]
 V_{cylinder, HL, L} = 0.6981 [ft³]
 V_{cylinder, HL, V} = 0 [ft³]
 V_{cylinder, L} = 0.6981 [ft³]

$V_{\text{cylinder,LL,L}} = 0.3491$
 $V_{\text{cylinder,LL,V}} = 0.3491$
 $V_{\text{cylinder,V}} = 0 \text{ [ft}^3\text{]}$
 $V_{\text{head,HL,L}} = 0.07757 \text{ [ft}^3\text{]}$
 $V_{\text{head,HL,V}} = 0 \text{ [ft}^3\text{]}$
 $V_{\text{head,L}} = 0.07757 \text{ [ft}^3\text{]}$
 $V_{\text{head,LL,L}} = 0.03879$
 $V_{\text{head,LL,V}} = 0.03879$
 $V_{\text{head,V}} = 0 \text{ [ft}^3\text{]}$
 $V_{\text{surge}} = 0$
 $V_{\text{surge,m}} = 0 \text{ [m}^3\text{]}$
 $V_{\text{total}} = 5.803$
 $V_{\text{total,HL,L}} = 0.7757 \text{ [ft}^3\text{]}$
 $V_{\text{total,HL,V}} = 0 \text{ [ft}^3\text{]}$
 $V_{\text{total,L}} = 0.7757 \text{ [ft}^3\text{]}$
 $V_{\text{total,LL,L}} = 0.3879$
 $V_{\text{total,LL,V}} = 0.3879$
 $V_{\text{total,m}} = 0.02197 \text{ [m}^3\text{]}$
 $V_{\text{total,V}} = 0 \text{ [ft}^3\text{]}$

Plant ammonia charge
calculation

American Refrigeration

Preferred Freezer

12/19/2013

Norton MA

Condenser charge

Line Size	SST	Linear feet of pipe	% liquid	total charge		
2"	35	92	100.00%	85.16		
2"	-20	3	100.00%	2.95		
2"	20	3	100.00%	2.83		0 #
5"	-20	5	100.00%	29.33		
5"	20	5	100.00%	28.08		
3/4"	-20	20	100.00%	2.54	HPR	8057 #
3/4"	20	20	100.00%	2.43	LTPP	6755 #
4"	35	54	100.00%	189.63	MTPP	7109 #
2 1/2"	35	44	100.00%	58.11	OP1-8" X 28"	32.75 #
1 1/2"	35	30	100.00%	14.62	OP2-8" X 28"	31.36 #
5"	35	57	100.00%	314.56	TSV	1412 #
4"	35	28	100.00%	98.33	LS-101 OIL COOLER	106 #
3"	35	56	100.00%	114.20	LS-102 OIL COOLER	106 #
1 1/2"	35	56	100.00%	27.30	HS-101 OIL COOLER	449 #
2 1/2"	20	320	50.00%	215.07	HS-102 OIL COOLER	449 #
3"	35	91	100.00%	185.57	HS-103 OIL COOLER	65 #
1/2"	35	12	100.00%	0.78		
				1371.48		24572.11 #

VESSEL CALCULATIONS

EVAPORATOR CHARGE

Evap FT^3 Quantity Total Charge in #
0

0.00

TOTAL CHARGE IN LIQUID 25943.59

Allowance for vapor in lines 10% 2594.36

Total charge 28537.94